

PMT Internal Review Interfaces

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1.21.11

Interface - Installation

Requestor (WBS):

WBS 1.7 Installation

Supplier (WBS):

WBS 1.8 PMT

Technical Details of Interface (including drawings when necessary):

1. PMT group provides 30 clean and ready to assemble PMT units. Each unit contains 1 PMT, 1 TPB coated plate, 1 backplane, 3 peek posts, and 1 primary cable (routed from PMT to patch panel).
2. PMT group provides rails that will be attached to brackets inside the cryostat. (Method of attachment TBD by Bill Sands' design in November.) These rails are what the support rack pieces will slide in on, and live on inside the cryostat.
3. PMT group provides 1 extra rail segment, as well as necessary stabilizers for the segment. It will extend outside of the cryostat for each support rack piece to stand on while PMTs are mounted, from which it will slide into the vessel. It will then be removed once all 5 support rack pieces are installed.
4. PMT group provides 5 clean pieces of support rack, ready to be fitted with PMT units.
5. PMT group provides the locking mechanism for the 5th piece of the support rack, nearest to the removable head of the vessel.
6. Installation group provides an A-frame for convenient transport of support rack pieces as well as other materials into the clean room for final assembly.
7. The PMT group provides 30 intermediate cables (routed from PMT to feed-through flange). These 30 cables, as well as a plumbing piece (small stainless steel tube and metering valve – comes from Cryostat WBS) for gas circulation and a braid for optional grounding of the patch panel, will be routed through the PMT feed-through flange, i.e. Nozzle type #1 located closest to removable head of vessel.
8. The PMT group requests a dehumidifier and UV filters on the lighting in the clean room outside of the cryostat, where the PMT units will be assembled and mounted to the support rack.

Interface - Electronics

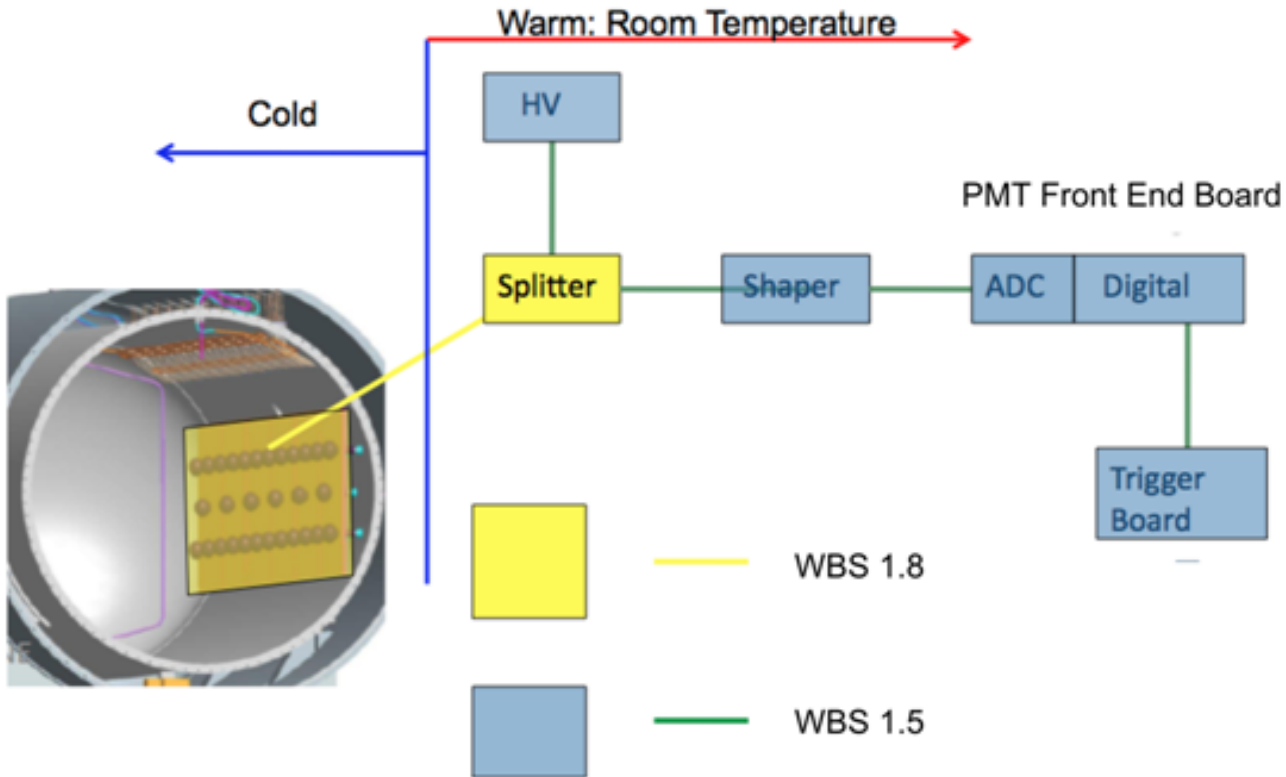


Figure 1: Division of responsibilities

Requestor (WBS):
PMTs 1.8

Supplier (WBS):
Electronics 1.5

Interface - Electronics

1. PMT group provides 30 signal splitters, one for each PMT. The splitters are mounted right above flange carrying PMT HV/signal to/from inside the cryostat (at top of the cryostat, Nozzle 1 closest to the open end). See *DocDB, PMT-Cryostat Interface*.
2. PMT group provides a box to hold the 30 splitters at a distance TBA from the feed thru flange and TBA from the HV supply.
3. PMT group provides 30 RG180 cables of length TBA, running from the splitter boxes to the PMT system.
4. Electronics group provides 30 RG59/U cables of length TBA, running from splitter box “HV in” (1 cable per box) to the PMT HV power supply. Connector on cable at the splitter box “HV in” end is female type BNC.
5. Electronics group provides 30 RG62A/U cables of length TBA, running from splitter box “Signal out” (1 cable per box) to a patch panel on the PMT readout electronics crate. Connector on RG62A/U cable at the splitter box “Signal out” end is male type BNC.

TBD – lengths of cables. But we have plenty of cable.

Interface - Electronics

Discussions to be finalized on 1/27/11:

- How to avoid ground loops at the splitter.
 - It is important to avoid ground loop at the splitter, but also important to avoid noise. Choosing cryostat as a ground is the best option to avoid noise. However, to keep the option we bring all ground to flange, without sharing ground at patch panel. If necessary we then have the option to choose another ground by isolating the flange from the cryostat.
- Electronics needs to know the gain the pmt's will run at and therefore the charge to be expected per pe.
 - Expected gain is order $1-5E7$ with nominal voltage ($\sim 1200-1400V$) in LAr, assuming some drop.
 - In a prototype measurement the average gain of 3 PMTs is $\sim 7E6$ (1000V) in air. This is a bit higher than the spec sheet ($3E6$ with 1000V) but agrees well within typical gain variation of PMT (factor 3?).

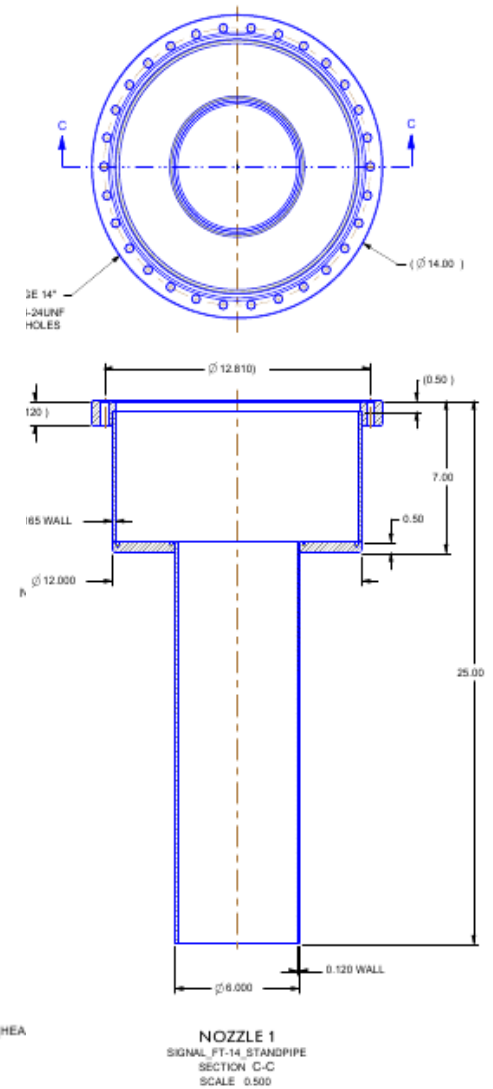
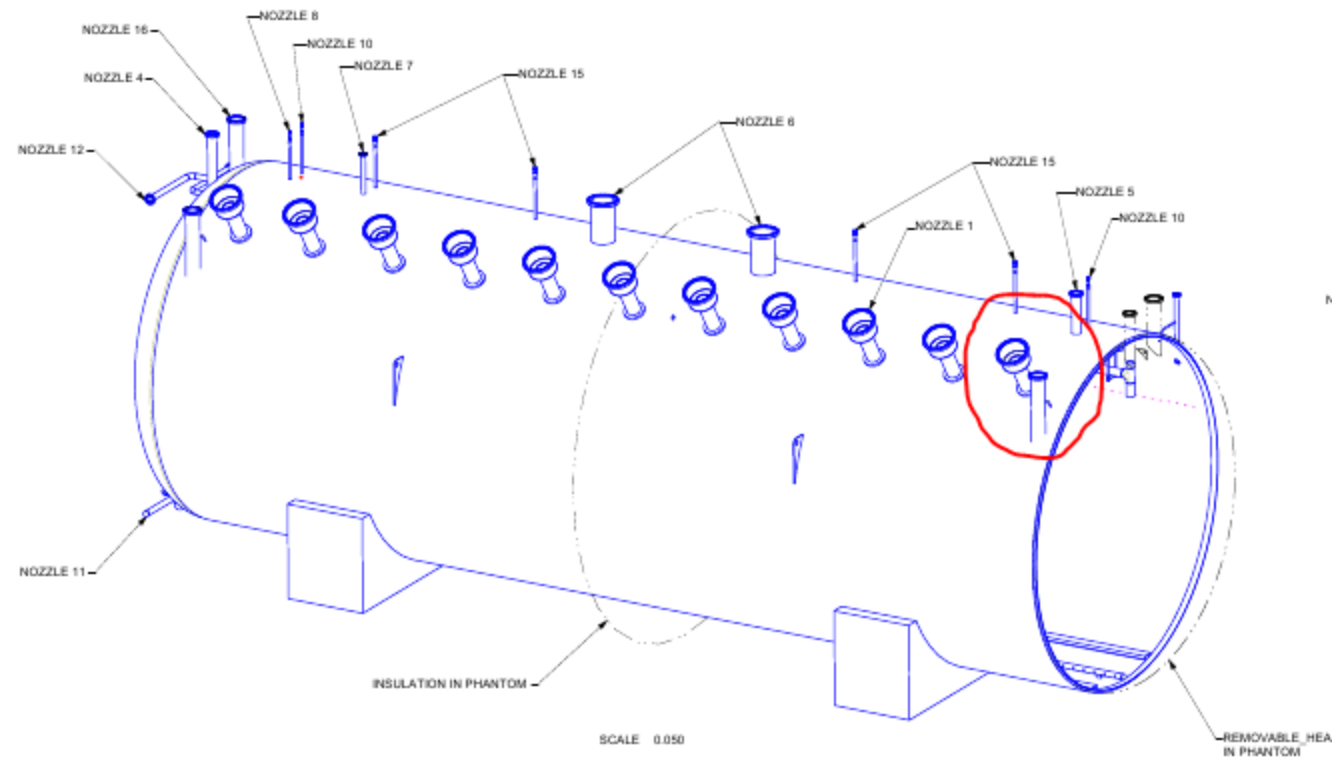
Interface - Cryostat

MicroBooNE Interface Agreement Form *Cryostat nozzle and flange for PMT system cabling*

Summary:

1. WBS 1.8 provides a blank 14-inch diameter Conflat® flange to be fitted in Nozzle 1, located closest to the open end of the vessel.
2. WBS 1.8 machines the flange to their requirements, including the required addition of an argon gas bleed valve to be specified by WBS 1.3.
3. WBS 1.8 provides 10 3-inch diameter feed-thrus to be fitted into the Conflat® flange, mounts all components on the flange, and supplies a complete flange/feedthru/cable system to WBS 1.7 for installation.
4. WBS 1.8 supplies WBS 1.3 with their requirements for space for the PMT system to be installed into the vessel after all other elements are already installed. WBS 1.8 will inform WBS 1.3 of any conflicts and suggest changes as necessary. Process iterates, if required, to find a satisfactory solution.
5. WBS 1.8 provides support rails for the Cryostat, to be mounted onto the brackets installed in the vessel by WBS 1.3, for installation and housing of the support rack.

Cryostat Nozzle

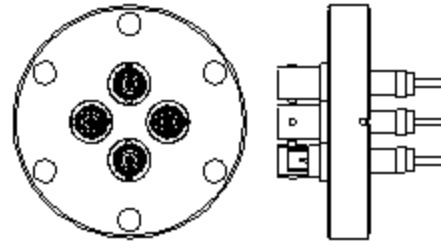


Cryostat – The FLANGE

We will use a 16.5” OD flange, like this one...



FA13393

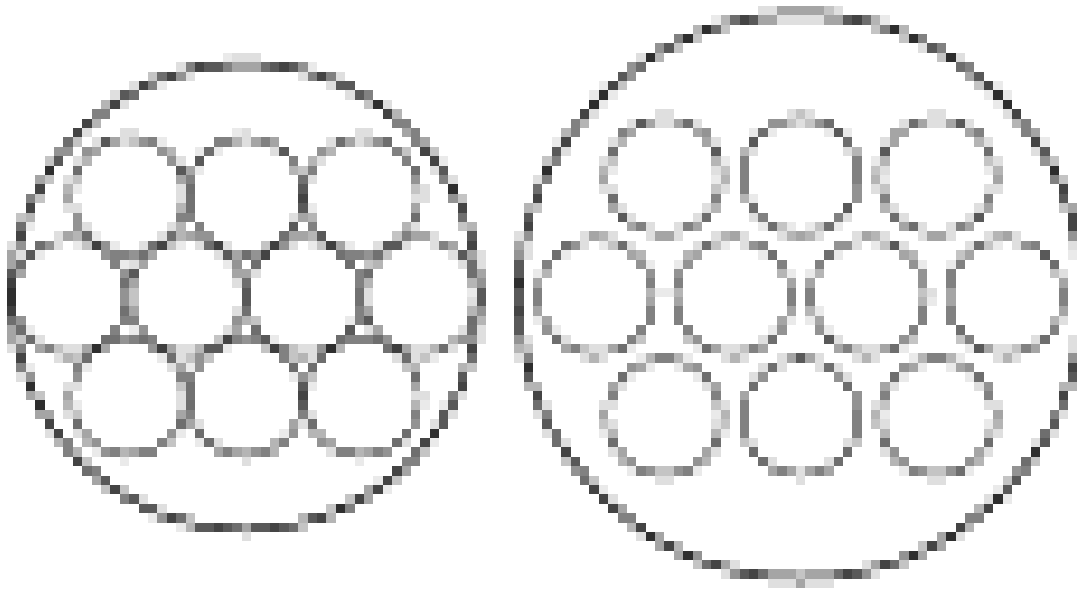


SHV 5 KV Grounded Shield Exposed 5KV 10 Amp 0.094 Nickel
Conductor 4 each in a CF2.75 Flange Without Plug

..With these feed-thrus.

- We will have 10 3” feed-thrus (x4 SHV connectors) to accommodate 40 cables.
- We can insulate the feed-thrus, if we decide not to ground to cryostat. (low probability that we will do this.)

Flange configurations – 12” and 14.5”



We prefer 14.5” in order to be able to easily fit the connectors on.

According to the Interface Agreement, we are purchasing this.

Notes

- TDR has been submitted to the collaboration for proofreading.
- MOU has been received by Princeton for the support rack.
- The support rack will be moving off of MIT and onto Princeton for the future.

A review of the charge

- ☐ Will the support rack meet the needs of the PMTs and integrate smoothly with the experiment?
- ☐ Have interfaces been agreed to?
- ☐ Are assembly and installation plans well thought out?
- ☐ Are future manpower needs sufficient and identified?
- ☐ Are milestones embedded in the schedule?
- ☐ Is CD-2 documentation complete?

✓ ...We think so!

We have time to implement any recommendations we receive between now and the Directors review.

Thank you to the committee for your time.